REMARKS:

Claims 20-32 are in the case and presented for consideration.

The undersigned and the Applicants thank the Examiner for taking the time and effort on June 3, 2010 to discuss this case. During the interview the undersigned presented the arguments that follow in these remarks, on the subject of support for the language of claim 20, and on the belief that claim 20 and its dependent claims are not obvious from the prior art combination.

112 Issue:

Claim 20 has been rejected under 35 U.S.C. 112, first paragraph as being based on a disclosure that does not support the passage "said mutual distance of said axes being so that the plasma density midway between said axes has a local minimum." Claim 20 has been amended to call for "said mutual distance of said axes being so that the plasma density substantially midway between said axes has a local minimum" and for this reason this rejection is respectfully transverse. In Fig. 7 and at page 12, paragraph [0044] of the specification as filed, there is shown and discussed, the plasma density distribution resulting from two plasma beams that are spaced apart as a function of the heating current I. The two axes A of the respective plasma beams and the mutual distance as claimed is clearly the distance between the two axes A since the horizontal axis of the graph of Fig. 7 is position of the beams in millimeters in the chamber, the first axis A being at the zero position and the second axis A being at about 70 mm in the graph. Substantially midway between the two axes A is at the location of about 35 mm, at the rotation axis Ar of the

workpiece (see specification paragraph [0046]) and at this location the plasma density has a local minimum in Fig. 7.

The language of claim 20 reading "said mutual distance of said axes being so that the plasma density <u>substantially</u> midway between said axes has a local minimum" is therefore believed to be supported by the application as originally filed.

As illustrated in Fig. 7, the smaller the spacing between the two beam axes A, the less significant will be this local minimum. As soon as the distance between axes A becomes small enough, the resulting plasma from the two beams will substantially appear as one "broadened" discharge without a midway minimum. Thus, the claimed feature of having a local minimum for the plasma density midway between the axes A, requires a relatively large distance between the two axes A of the plasma beams, and this is important when considering the teaching of the prior art.

<u>103 Issue:</u>

Claim 20 and its dependent claims have been rejected as being obvious under 35 U.S.C. 103 from a combination of U.S. Patent 5,753,045 to Karner in view of U.S. Patent 5,340,621 to Matsumoto alone, or taken further in view of tertiary references for some of the dependent claims.

In Matsumoto the plasma generated by the two discharge arrangements of respective cathodes 2 and anodes 6, is spread by a plasma compressive, permanent magnet, into a thin plane-shaped, sheet-like plasma, spreading parallel to the substrate (see col. 6, line 5ff. of Matsumoto). Accordingly, the skilled artisan is taught by Matsumoto that a local minimum of plasma density which might have occurred between the two cathode/anode arrangements, is to be <u>avoided</u> by establishing the compressive permanent

magnets so as to result in a sheet-like plasma distribution with homogeneously distributed density, and especially with no local plasma density minimum midway (or anywhere else) between the two beam axes respectively defined by the two pairs of anodes/cathodes in this reference. Please also see Figs. 1, 4 and 5 of Matsumoto that graphically show the skilled artisan what the two thin plane-shaped, sheet-like plasma areas should look like, and please compare this teaching to Fig. 7 of the present application.

Thus and in opposition to the vacuum treatment installation as claimed in claim 20, Matsumoto teaches in fact to avoid inhomogeneous plasma density distribution as caused by distant plasma discharges along respective axes.

According to the invention as claimed, the plasma beam axes A are spaced apart by such an extent that the local minimum as shown in Fig. 7 occurs. This allows larger overall surfaces to be treated by a smaller number of distinct plasma beams. Additionally, no measures are needed such as, e.g., compressive magnetic fields so as to homogenize the distinct plasmas, and thus the overall treatment apparatus becomes substantially less expensive and easier to control.

Therefore, if the skilled artisan considers Matsumoto in the context of Karner with its single plasma beam, the skilled artisan would provide - as the Examiner correctly addresses on page 5 of the Final Action - a second plasma beam discharge configuration to the apparatus of Karner, but, if the combination where to make any sense, the artisan would also provide measures such as the magnetic field as taught by Matsumoto so as to homogenize the resulting plasma density resulting from the two plasma beam discharges and would clearly avoid a purposefully maintained local plasma density minimum midway between the two axes of the two plasma beams as claimed and required by claim 20.

By no means will the skilled artisan be taught by combining Karner and Matsumoto,

to maintain the local minimum of plasm density - thus making "spreading means" obsolete - and to approach treatment homogeneity by appropriately <u>tailoring and arranging surfaces to be treated</u> with respect to the distinct plasma discharges. Using magnetic fields on two distinct plasma discharges to form a single unitary, sheet-like and thus substantially homogeneous plasma distribution as taught by Matsumoto is significantly more critical to control than, as claimed here, maintaining the two plasma discharges distinct from each other, thereby establishing a local minimum of plasma density between the two beam axes and tailoring and arranging the surfaces to be treated by such plasma so that the treatment result becomes homogenous.

Therefore, the claimed invention, even if its advantages are put aside, is clearly directed to a different approach for homogeneous treatment from any obvious combination of Karner and Matsumoto that teach homogenizing the plasma discharge.

The invention of claim 20 is directed to maintaining the plasma discharge to be inhomogeneous and resolving the problem of homogeneous treatment distribution by respective local arrangement of the surfaces to be treated with respect to the inhomogeneous plasma discharge.

While the dual plasma source of Matsumoto may suggest using two plasma sources in Karner, recalling Figs. 1, 4 and 5 of Matsumoto and its col. 6, lines 5ff, it does not suggest maintaining a minimum of plasma density anywhere between the two axes of the plasma discharges and to nevertheless achieve a desired homogeneity of treatment along a surface by respectively arranging and tailoring such surface with respect to the two plasma discharges. Although it is true that Karner teaches placing the substrate at a position where the plasma density is less than 20%, Karner also teaches one plasma beam and thus does not explain how one would avoid interactions between two or more distinct

plasma beams as claimed. Matsumoto seeks to avoid this presumably adverse interaction by adding magnetic fields to smooth out the plasma, and this is contrary to the claimed invention as illustrated in Fig. 7 of the subject application.

Karner teaches the simpler case of one plasma beam, and, since it also accommodates the non-homogeneous plasma density shown in its Fig. 2, the question is why couldn't the skilled artisan just use the two beam teaching of Matsumoto, but, in view of Karner's single, spiked density beam teaching, just ignore the Matsumoto teaching that the two plasma densities must also be magnetically spread out.

The answer is believed to be that the combination cannot ignore the Matsumoto plasma spreading requirement since there is no teaching in Karner on how a second plasma beam can be accommodated without disrupting Karner's teaching that the workpieces should always be in an area where the plasma density profile is flat (see col. 7, lines 24-29). The cylindrical workpiece carrier 24 in Karner is arranged symmetrically around the single cental plasma beam 1 on axis A (see Fig. 3 of Karner) and Karner says that the treatment is successful because one can keep all the workpieces at a radial distance from the plasma density peak where the profile is very flat (col. 7, line 27 and Fig. 2 of Karner). There is no indication in Karner, where or how a second plasma beam can be added in the cylindrical, single beam geometry of Karner, and still keep all the workpieces in a very flat profile area. Only Matsumoto teaches how two plasma beams can be used together, but only if the densities are spread out.

The invention and discovery of the present application for the first time discloses and claims the possibility of using two or more plasma beams that have local minimum plasma densities between them, but that still can homogeneously treat workpiece surfaces even outside the symmetrical cylindrical Karner geometry, by also carefully placing the

workpiece surfaces with respect to <u>all</u> of the plasma beams.

It is therefore believed that the combination of Karner and Matsumoto would not reach claim 20 in an obvious manner contemplated by 35 U.S.C. 103.

The dependent claims further distinguish the invention and, in any case, further limit claim 20.

Accordingly, the application and claims are believed to be in condition for allowance, and favorable action is respectfully requested. No new matter has been added and if any issues remain, the Examiner is respectfully invited to contact the undersigned at the number below, to advance the application to allowance.

Respectfully submitted,
/PETER C MICHALOS/
Peter Michalos
Reg. No. 28,643
Attorney for Applicants
(845) 359-7700

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NOTARO & MICHALOS P.C.
100 Dutch Hill Road, Suite 110
Orangeburg, New York 10962-2100

Customer No. 21706

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